REMARKS/ARGUMENTS

In the Office Action, dated June 1, 2006, the examiner withdrew claims 14-18 from further consideration and made the restriction requirement from the previous office action FINAL. The examiner also withdrew the rejection(s) of claim(s) based on the previously cited prior art. However, the examiner asserted new grounds for rejecting all of the pending claims 10-13, and 19-39 under 35 U.S.C. § 103(a) based on combinations of newly cited references, to wit, Freeman (U.S. Patent No. 5,279,169), Bevenot et al. (U.S. Patent No. 6,185,344), Siebert et al. (U.S. Patent No. 6,277,589), Young et al. (U.S. Patent No. 6,120,936), and Takehashi et al. (U.S. Patent No. 4,475,963).

The Applicant traverses the examiner's rejection of the pending claims without amendment to the claims for the reasons explained below.

Re Independent Claims 19, 28, and 33:

The examiner rejected the Applicant's independent claims 19, 28, and 33 under 35 U.S.C. § 103(a) as being unpatentable over Freeman in view of Bevenot. However, the Applicant believes that the examiner has erroneously attributed certain of applicant's claimed elements to Freeman, which Freeman does not teach or fairly suggest.

First, each of the Applicant's independent claims 19, 28, and 33 recite a ***predetermined sample volume*** into which hydrogen from the object (e.g., metal or weld 16) is allowed to evolve. Freeman does not have such a predetermined sample volume, and there is no reason for the Freeman apparatus to have one.

On the contrary, Freeman's sample volume is defined by a chamber 7 with a flexible wall 6, and his only requirement is that it be minimized and that it remain constant during a particular sampling period. See Freeman, column 8, line 24, through column 9, line 12. However, Freeman never knows and does not care what the actual size of his volume is in any particular sample. Instead, Freeman merely evacuates his chamber 7, thereby pulling his flexible wall 6 down onto the surface 2 of his object 1, and then he monitors the gas pressure in his chamber 7 as an indication of whether some, more, less, or no hydrogen evolves from his object 1 into his chamber 7. See Freeman, Figure 5. Freeman makes no attempt to actually quantify the actual volume of hydrogen gas in his chamber 7 or the actual rate of hydrogen accumulating in his

chamber 7, let alone to quantify diffusible hydrogen concentrations in his object 1. Also, please note in this regard that a hydrogen concentration in Freeman's chamber 7 is not the same thing as diffusible hydrogen concentration in his object 1 (metal) from which the hydrogen evolves, and Freeman has no way of getting from his pressure measurements to diffusible hydrogen concentration in his object 1.

In contrast, the Applicant's apparatus can be used to actually quantify the diffusible hydrogen concentration in the object itself. Specifically, the diffusible hydrogen measuring apparatus 10 described and claimed in this patent application yields quantitative measurements of diffusible hydrogen concentration in the metal object, e.g., in the weld 16, as a function of hydrogen diffusion rates from the metal surface 17. Contrary to the examiner's assertions on pages 3 and 4 of the Office Action, Freeman never calculates any quantity of hydrogen present, any rate of hydrogen diffusivity in a sample, or any rate of change of hydrogen in the sample volume. While Freeman makes the general statement that "Periodic vacuum readings will illustrate the rate of hydrogen accumulation . . ." (see, e.g., Freeman, column 9, lines 26-28), there is no teaching in Freeman or in any other reference cited, including Bevenot, as to how such "periodic vacuum readings" could be converted to an actual quantitative, as opposed to relative, accumulation in his chamber. The Applicant's apparatus uses a predetermined sample volume as one parameter in one of a number of steps to get actual quantifications of hydrogen volumes, rates of changes of hydrogen, and finally diffusible hydrogen concentration in the object itself – all from readings of one detector. Freeman never mentions and has no way of getting a predetermined sample volume from his flexible chamber.

Second, the examiner cited Bevenot for its disclosure of a hydrogen sensor comprising a layer of hydrogen-reactive chemochromic material as well as a light source optically connected to the sensor, etc., wherein the properties of light reflected from the layer of hydrogen-reactive material varies as a function of hydrogen concentration. See Office Action, page 4, last paragraph, through page 5, line 4. The Applicant concurs with that much of the examiner's description of Bevenot. However, as mentioned above, it is important to distinguish between: (i) detection of hydrogen concentration in the gas that contacts the sensor, e.g., hydrogen gas in a chamber where the sensor is situated, and (ii) the concentration of diffusible hydrogen in the metal (e.g., weld material) itself. The detection of hydrogen concentration in applicant's sample volume 18 is only an intermediate step in quantifying diffusible hydrogen concentration in the

object (e.g., weld 16). There is no teaching or suggestion in either Freeman or Bevenot as to how such detection of hydrogen concentration in a gas that contacts Bevenot's hydrogen-reactive, chemochromic material can yield a quantitative, diffusible hydrogen concentration in the object, e.g., metal or weld, from which the hydrogen evolves.

In the Applicant's apparatus, there is a "predetermined sample volume," which is used to correlate rate of change in detected light (i.e., rate of change in hydrogen concentration in the sample volume) to rate of change of hydrogen ***volume*** in the sample ***volume***. Neither Freeman nor Bevenot teach or suggest anything about providing a sample volume that can even be predetermined, let alone actually predetermining it and then undertaking the next steps of figuring out how they might be able to correlate their pressure or light measurements that indicate hydrogen concentrations with a predetermined sample volume to rates of change of hydrogen volume in the predetermined sample volume and then to a diffusible hydrogen concentration in the metal object. In other words, Freeman and Bevenot both stop at least four steps short of getting from their measurements to a diffusible hydrogen concentration in the object from which the hydrogen evolves, and neither of them teaches or suggests pre-determining a sample volume as one of those steps.

Freeman's chamber-defining member 6 is purposefully made flexible. See Freeman, column 5, lines 6-8 and 63-66. Bevenot has a glass ferrule 3, but it has a plurality of orifices 4 for communicating with the environment. See Bevenot, column 5, lines 7-9. Therefore, Bevenot does not have a sample volume that can be pre-determined either.

Freeman takes his pressure measurements over a period of time, which, as explained above, provide relative rates of change of hydrogen concentration in his chamber 7, but he has no way of quantifying such hydrogen concentrations from his pressure measurements. Even if Bevenot's device was substituted for Freeman's pressure sensor to get a hydrogen concentration, neither one of them teach predetermining their sample volumes, and they have no reason to do so.

The examiner asserts on page 7 of the Office Action that it would have been obvious to combine Freeman and Bevenot to calculate "diffusible hydrogen in the sample volume . . . ." Allowing that the examiner may have inadvertently referred to hydrogen in the sample as "diffusible," which in the vernacular of Applicant's apparatus usually refers to the hydrogen in the object, the applicant would concur with the examiner's assertion to the extent that a

combination of Freeman and Bevenot might enable a person skilled in the art to calculate hydrogen concentration in a gas sample and perhaps even changes of hydrogen concentration in a gas sample.

However, the examiner's assertion on page 7 of the Office Action then makes the unwarranted and unsupported leap to a rate of change of hydrogen itself in the gas sample volume, as opposed to mere hydrogen concentration levels. That leap, which first requires determining actual sample volume and then calculating the hydrogen fraction of the predetermined sample volume for a plurality of hydrogen concentration measurements, can only be made in hindsight using the applicant's claims as a guide. There is nothing in either Freeman or Bevenot that would suggest or provide any incentive to determine the actual volume of their samples, let alone to go the next step of using such actual volumes to determine the hydrogen fractions of the sample volume over time to get to a rate of change of hydrogen itself in their sample volumes, much less to go even farther, i.e., to predetermine a relationship between rate of change of hydrogen in the predetermined sample volume to diffusible hydrogen concentration in the object and to then use such predetermined relationship to actually determine the diffusible hydrogen concentration in the object based on measured changes in the hydrogen sensor. As explained above, none of these at least four additional steps, from where Freeman and Bevenot leave off, are suggested in any of the prior art references cited by the examiner.

For an obviousness rejection under 35 U.S.C. § 103(a), "[t]here must be a reason or suggestion in the art for selecting the procedure used, other than the knowledge learned from the applicant's disclosure." *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 U.S.P.Q.2d 1529, 1531-32 (Fed. Cir. 1988). In this case, without the applicant's disclosure and claims as a guide, there is nothing in Freeman and Bevenot that would point to more than a few of the many steps that are required to correlate hydrogen sensor measurements to actual diffusible hydrogen concentration in the metal object, so the obviousness rejection of applicant's independent claims 19, 28, and 32 based on those references is not supported by their disclosures.

For the reasons explained above, Applicant's independent claims 19, 28, and 33 are allowable over Freeman in view of Bevenot. Therefore, the examiner is respectfully requested to withdraw the rejections of those claims.

Re Claims 25-27, 33, and 38-39:

No one in the prior art references cited by the examiner has even proposed a method of measuring diffusible hydrogen in an object (e.g., a weld) directly from measurements taken with a hydrogen sensor device, much less proposed or even suggested the series and combinations of calibrations that have to be created, performed, and applied in order to get directly to a measurement of diffusible hydrogen in an object from a hydrogen sensor reading. As explained above, a few of the initial steps, i.e., detection of hydrogen concentration in an unknown volume of sample gas, may be inferred from a combination Freeman and Bevenot, but they provide no insight whatsoever regarding the calibration of rate of change of volume of hydrogen to the sensor output, let alone the next level of getting to a calibration that provides diffusible hydrogen concentration in an object from the sensor output.

Therefore, claims 25-27, 33, and 38-39 are also allowable, and the examiner is requested to withdraw the rejections of those claims as well.

Re Claims 29-31 and 34-36:

The examiner rejected claims 29-31 and 34-36 under 35 U.S.C. § 103(a) as being unpatentable over Freeman and Bevenot and further in view of Siebert et al. (U.S. Patent No. 6,277,589). However, this patent application and the Siebert et al. patent were, at the time this invention was made, owned by, or subject to an obligation of assignment to, the same company, i.e., Midwest Research Institute. Therefore, as provided by 35 U.S.C. 103 (c), Siebert cannot be used to preclude patentability of this invention. Consequently, the examiner is requested to withdraw the rejection of claims 29-31 and 34-36.

Summary

All of the claims 10 and 12-39 are believed to be allowable for the reasons explained above. Any dependent claims addressed above are believed to be allowable in their own right for the reasons explained, and the other dependent claims are also allowable as being dependent from allowable claims. Therefore, the examiner is requested to reconsider the previous rejections of these claims and to grant an early allowance. If any issues remain to be resolved, the examiner is requested to contact the Applicant's attorney at the telephone number listed below.

Respectfully submitted,

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